50, 100, or 200 diameters. The inks of commerce vary somewhat in composition, hence the facility with which certain crystalline forms are obtained differs. All inks, however, having a base of solution of gall-nuts and sulphate of iron, give analogous results.

Dr. Trouessart hesitates to express an opinion as to the nature of the salt which crystallises in the forms illustrated. The crystals chiefly belong to the cubical system, and this suggests that they are magnetic oxide of iron. On the other hand, their white colour, and the peculiar shapes of some of the groups of crystals, indicate that iron disulphide or marcasite is the substance in question. Perhaps some worker in chemical crystallography will determine the point.

NOTES.

WE learn from the *Lancet* that the late Prof. Pouchet, of the Muséum d'Histoire Naturelle, has bequeathed his entire fortune to the Paris Society of Biology. The bequest is made in the following terms: "N'ayant pas de famille, je lègue tout ce que je possède à la Société de Biologie, où j'ai toujours trouvé bon accueil et sympathie depuis le jour où j'en ai été membre. Je crois fermement que c'est le meilleur usage social à faire du peu de bien que je laisse environ 2000 francs de rente." (£80 a year).

DR. WALTER DICKSON, R.N., the author of "The Antarctic Voyage of H.M.S. *Pagoda*," and several works on naval hygiene, died on the 9th inst. at the age of seventy-three.

BY the recent death of Lieut.-Colonel Garrick Mallery, in his sixty-fourth year, the U. S. Bureau of Ethnology has lost one of its chief ornaments. The results of his important researches into the sign and gesture language of American aborigines occur in the current annual report of the Bureau.

THE *Times* reports a severe earthquake and volcanic eruption at Ambrym, an island in the New Hebrides group. The disturbance is said to have occurred on October 15, when several severe shocks were felt throughout the whole island. Immediately afterwards the volcano, which is 2500 feet high, was observed to be in active eruption. The lava destroyed the native villages on one side of the island, and a large number of natives sought refuge on board H.M.S. *Dart*, which was cruising off the coast. Considerable damage appears to have been done in a large portion of the island

THE Christmas course of lectures, adapted to children, at the Royal Institution, will be delivered by Prof. J. A. Fleming, F.R.S. The subject will be "The Work of an Electric Current," and the first lecture will be delivered on Thursday, December 27, at three o'clock.

FOR several weeks the weather over the British Isles has been very unsettled, but no gales of serious importance had been generally experienced until Sunday night, when a deep barometric depression reached our south-west coasts from the Atlantic, accompanied with very heavy rainfall in the south and west; the amount measured at Scilly during twenty-four hours ending 8 a.m. on the 12th instant amounted to over three inches, or nearly the average fall for the month, while at Hurst Castle, on the Hampshire coast, the fall exceeded two inches. The central area of the storm passed the whole length of the English Channel, and crossed the North Sea during Monday night, strong northerly gales being experienced in the rear of the disturbance, accompanied with thunderstorms, hail, and more heavy rain, the amount measured in London on the 13th instant being about 0·75 inch. A very rough sea was experienced in the English Channel and in the Irish Sea. This disturbance was followed by another which approached our extreme north-west coasts on Tuesday night, causing strong gales over all parts of the country, and very heavy rain in the west. The temperature has been from 4° to 6° above the mean; during the week ended the 11th instant the highest maxima recorded were 61° in the Channel Islands, and 60° in the south of England, and the lowest minima fell to 29° in the south-west of England, and to 32° in the Midland Counties.

PROF. GUIDO CORA, of Turin, will, on his approaching birthday, December 20, be presented by his former students with "a special mark of esteem and affection" in the form of a memorial in recognition of the twenty-fifth anniversary of his first published paper. It is well known that he founded and has maintained the geographical journal, *Cosmos*, at his own expense. In order to give his many scientific friends an opportunity of sharing in the general recognition of Prof. Cora's labours, Prof. Paul Revelli, 12 Via Galliari, Turin, is prepared to receive any written "sentiment," portrait, drawing, or signature for the memorial volume. The date up to which such tokens of respect may be sent is extended to March 31, 1895.

DR. DONALDSON SMITH, who left London early this summer to attempt to reach Lake Rudolf from the north-east, has been able to send letters home from a position in 7° 11′ N., and 42° 11′ E., dated early in September. He had formed a caravan at Berbera, started with more than a hundred camels, and travelled south-westward through an unmapped country, of which he has made a running survey. At Turfa he reached a great river, which he believes to be the Erer, and to be continuous with the Webi Shebeli. Being unable to cross, he spent a week in following the course of this river, thirty miles of which he has mapped; and on his return he succeeded in finding a ford, where the caravan crossed with much difficulty. The country was very thinly peopled, on account of wars between the Gallas and Ogadams, but some natives were found to carry letters to the coast, a task which they must have performed very expeditiously. Dr. Smith has made large collections of the fauna and flora of the region traversed, and has had some thrilling adventures with big game. His men were doing well, and he was confident of success in his journey, although the time necessary to complete it appeared likely to be rather longer than was originally expected.

THE death is announced of Colonel R. Y. Armstrong, C.B., F.R.S., late of the Royal Engineers. He was born in 1839, and was the son of the late Rev. W. Armstrong, of Cairy, County Sligo.

IN the last number of the *Scottish Geographical Magazine* Mr. W. S. Anderson, of the Scottish Marine Station, discusses the relative merits of the methods for determining the density of sea-water by means of hydrometers and by direct weighing. He shows that if the temperatures of water, instrument, and air are in equilibrium, and the observations made on land, the *Challenger*-type hydrometer yields results of equal value with those of Sprengel tubes, provided the mean of a large number of observations is taken. At sea the hydrometer is less satisfactory. Mr. Anderson throws discredit on previous work in this direction, and assumes that the work of some earlier observers showed large discrepancies on account of the scale of the hydrometer being read from the wrong end. Unfortunately, he does not make any reference to the place where this work is published. By the use of a very large hydrometer admitting of the detection of extremely delicate differences in density, Mr. Anderson satisfied himself that capillarity has no perceptible effect upon the accuracy of the readings. By a series of observations at different temperatures he has been able to construct new tables for the reduction of observed densities to standard temperature, and for the calculation of the function D, which is the difference of density between the sample and pure water divided by the number of grammes of chlorine per litre, a function to which considerable importance is now attached in the discussion of the relative differences between samples of sea-water.

OUR excellent contemporary, *The Engineering Magazine*, commenced a "Review of the Industrial Press" in the October number, and an index of current technical literature. The object of this review and index is to give concisely-written notices of the most important articles of the month; and to supply a carefully classified index to all the articles published currently in the scientific and industrial press of the United States and Great Britain. An entirely new feature is the establishment of a department to supply all or any portion of any article reviewed or indexed. That technical journalism has grown to proportions and importance which warrant such a development, is a fact at which we can all rejoice.

OBSERVATIONS on the variations in level of well-water have been made for the last three years at the Observatory of Catania in Sicily, and the first results are described in a paper by A. Riccò and S. Arcidiacono (*Boll. mens. dell' Acc. Cioenia di Sci. Nat. in Catania*, fasc. 37, June 10, 1894.) They classify the movements into progressive, annual and accidental, subdividing the latter into meteoric and geodynamic. The accidental variations of geodynamic origin consist of small abrupt changes of level, generally downwards, which frequently correspond to movements of the ground. Shortly before the eruption of Etna in 1892, and for several months after, the changes in level of the water-surface were extremely irregular. From June 1, to December 31, 1892, corresponding to thirty-nine groups of earthquakes, there were abrupt changes of level within twenty-four hours in twenty-one cases; there were also fifty small but marked changes coinciding with strong oscillations of the tromometer. Somewhat similar observations have been made in Wisconsin, by Prof. F. H. King (U. S. Dep. of Agri. Weather Bureau, *Bull.* No. 5). Here the shock was imparted by heavily-laden trains passing less than fifty yards from the well; but the surface of the water invariably rose, sometimes as much as one-tenth of an inch, returning to its former level after a few seconds.

AT a recent meeting of the Academy of Science of Amsterdam, Herr C. H. Wind read a note on the Kerr phenomenon. The author breaks up the electric current into two parts—a current of conduction and a displacement current—and to these attributes, as Lorentz has done, the Hall effect. He supposes, however, that the electromotive force which constitutes the Hall effect is different for the two constituents, while Lorentz supposes them to be equal. The introduction of this hypothesis into the calculations of Van Loghem does not alter the general form of the results, but has the effect of giving expressions for the phase and the amplitude of the magneto-optic component which differ by a constant quantity and a constant angle from the old values. In this way the difference of phase discovered by Sissingh is explained; and from the observed value of this difference of phase the ratio between the intensity of the Hall effect for the displacement and conduction currents can be calculated, and then from observations of the amplitude the value of each of these can be found. From the calculations made by the author, it appears that the values thus obtained are of the same order as those got by direct observation of the Hall effect, if we suppose that the specific resistance of metals for periodic currents of extreme rapidity is greater than for continuous currents. This view is further supported by other calculations which have been made by the author. The paper concludes with a comparison between the above theory and the theories propounded by Thomson, Goldhammer, and Drude.

IN No. 38 of the *Sitzungsberichte* of the Berlin Academy, Prof. Goldstein gives an account of a curious effect which the cathode rays exert on the colour of certain salts. If potassium chloride be made to phosphoresce in a radiation-tube, it quickly assumes a strong heliotrope shade, and eventually becomes bright violet. On heating, the colour changes to blue, and at high temperatures the salt becomes white. The same series of colour-changes may be obtained with this decolourised salt, and also with naturally occurring potassium chloride or sylvine. Several haloid salts of the alkali metals were examined, and with the exception of cæsium and rubidium chlorides all gave after-colours. The chlorides of barium and strontium gave no after-colours. In ordinary air the colour disappears the more quickly the more soluble the salt. The colour of lithium chloride fades almost immediately; the blue colour of sodium chloride lasts about a day. In contact with water the salts at once lose their colour. In a vacuum or in dry air the deep blue colour of lithium chloride has now lasted for two months without apparent change. The colour of potassium chloride gradually fades and completely disappears in about a week; the behaviour of most of the salts is like that of potassium chloride. The cause of these phenomena is unknown The salts were as pure as could be obtained. Electrodes of different materials gave the same results. The radiation-tubes contained, of course, a little mercury vapour, but none of the known compounds of mercury with the constituents of the salts have the colours above described. Chemical decomposition is unlikely, since the coloured salt gradually changes into its original condition. The author inclines to the view that during phosphorescence the particles of the salt have been made to take up positions and motions differing from those of the unaltered substance, and that a physical modification of the salt has thus been brought about.

SOME efforts have again been made in France to overcome the air resistance which a locomotive encounters when running at a high rate of speed. *La Nature*, for October 27, contains a very interesting article by M. Max de Nansouty, descriptive of the experiments of M. Ricour, originally made in 1887. In these, inclined planes were placed in front of the engine, and by adopting this means, making the slanting planes four in three, and filling up the spokes of the wheels, the resistance was diminished by one half. This resulted in a notable increase of useful work, and an economy of ten per cent. on the coal consumption. The results are so satisfactory that M. Ricour has fitted his apparatus on forty engines belonging to the Paris-Lyon-Mediterranée Railway, for general traffic. Similar experiments were carried out in 1890 by M. Dresdouit, chief engineer to the State railways, and they were of more prolonged character. The engines in this case were ran 300,000 kilometres, and by means of this apparatus they saved six to eight per cent. in coal consumption, and sometimes as high as twelve per cent. M. Max de Nansouty tells us, however, "il est vrai que le chauffeur et le mécanicien étaient excellents." A few other experiments were tried with seemingly the same satisfactory results. The main point, however, that, on an average, a benefit of four to five per cent. is obtained by the use of these inclined planes, and it is asserted that this is more than the saving obtained from locomotives with compound and other systems. If the statement be true, our locomotive superintendents had better take heed, as nothing has yet been done in this direction. We are not told, however, how the apparatus behaves with a side wind.

WE have received a catalogue of botanical works offered for sale by Messrs. Dulau and Co. The books refer to the anatomy, morphology, and physiology of plants.

THE *Journal* of the Sanitary Institute, vol. xv. part iii., contains the addresses delivered at the Congress held at Liverpool in September. Dr. J. F. J. Sykes contributes a report of the proceedings of the International Congress of Hygiene, Budapest.

MESSRS. BLACKIE AND SON have published the seventh part of Kerner and Oliver's "Natural History of Plants." The new part, which is just as admirable as the previous ones, concludes the section on climbing plants; and deals with erect foliage stems; the resistance of foliage stems to strain, pressure, and bending; the floral stem. It also contains the beginning of the section on the forms of roots.

"ELECTRIC Lighting and Power Distribution," by Mr. W. Perren Maycock, published by Messrs. Whittaker and Co., has reached a second edition. The book is described as "an elementary manual for students preparing for the preliminary and ordinary grade examinations of the City and Guilds of London Institute." It is profusely illustrated and clearly written, and is altogether a good introductory text-book of technical electricity.

DR. OSCAR GRULICH has prepared a history of the foundation and growth of the K. Leopoldinisch - Carolinischen Akademie der Naturforscher at Halle. The volume is dedicated to Halle University, which celebrated its bi-centenary this year. The first president of the Academy was J. J. Baier, who held the office from 1731 to 1735. Many eminent investigators have occupied the president's chair since then, and Prof. Dr. Knoblauch has held it since 1878. Dr. Grulich's book chiefly deals with the famous library and scientific collections of the Academy.

THE third volume of Sir David Salomons' "Electric Light Installations," dealing with the applications of electric energy, has been published by Messrs. Whittaker and Co. It will be remembered that the original work, "Electric Light Installations and the Management of Accumulators," was in one volume, and it was not until a seventh edition was demanded that the division into three volumes took place. The present volume is mainly concerned with the mechanical details which interest the electrical engineer, and the workmen engaged in electric installations, and to such we cordially recommend it.

Science Progress for November contains five articles of technical interest and importance. Dr. A. D. Waller, F.R.S., describes the state of knowledge of inhibitory phenomena; Mr. J. W. Rodger contributes the third of a series of articles on the new theory of solutions. Recent researches in thermal metamorphism are described by Mr. Alfred Harker. Mr. S. H. Burbury, F.R.S., discusses Dr. H. W. Watson's "Treatise on the Kinetic Theory of Gases" and a communication made by Prof. Tait to the Royal Society of Edinburgh, "On the Foundation of the Kinetic Theory of Gases." Finally, Prof. A. C. Haddon gives a bibliography of the ethnography of British New Guinea.

THE "Division of Microscopy" of the United States Department of Agriculture is publishing a very useful series of small manuals under the title "Food Products." The first three numbers deal almost entirely with edible and poisonous fungi, with directions for their identification, and for the culture and preparation for the table of the edible species. They are illustrated by excellent coloured and uncoloured plates. It is a significent illustration of the wide distribution of the lower as compared with the higher forms of vegetable life, that every one of the twenty-four edible and twelve poisonous species of fungus here described is a familiar European species. The letterpress is written by Dr. Thomas Taylor, chief of the Division of Microscopy.

THE Meteorological Council have just issued a volume containing the meteorological observations made at stations of the Second Order, for the year 1890. Such observations have been published in a more or less complete form since 1866, and the present volume contains returns from sixty-eight stations, part of the information being obtained from the English and Scottish Meteorological Societies. A map shows the distribution of the stations, which are well distributed over the United Kingdom, although in some districts, especially in the West of Ireland, there appears to be difficulty in obtaining good observers. In addition to daily observations at many stations, the work contains carefully prepared monthly and yearly summaries, and a table showing the number of hours of bright sunshine for each month at those stations which are provided with sunshine recorders.

IN 1815 there was published in Philadelphia the second edition of a "Geographical, Historical, and Commercial Grammar," by William Guthrie. This edition contained an account of North American Zoology, by George Ord, which was by far the most complete and accurate that had appeared. Prof. Baird, in his work on the mammals of North America, refers frequently to this contribution to Guthrie's Geography, and his citations have helped to establish its importance. The Academy of Natural Sciences, Philadelphia, being desirous of rescuing Ord's work from extinction, determined to reprint it. After considerable difficulty, a copy of Guthrie's Geography was found, containing marginal pencil notes by Ord, on the zoological portion. This section of the book has now been reprinted, with the notes, and to it Mr. S. N. Rhoads has added an appendix on the more important scientific and historic questions involved. The reprint will be heartily welcomed by students of the systematic zoology of America.

HELMHOLTZ remarked, in the autobiographical address delivered on the occasion of his jubilee: "Many a time when the class was reading Cicero or Virgil, both of which I found very tedious, I was calculating under the desk the path of rays in a telescope, and I discovered, even at that time, some optical theorems, not ordinarily met with in text-books, but which I afterwards found useful in the construction of the ophthalmoscope." The enquiring student of the present time has no difficulty in finding optical theorems not referred to in the text-books in common use, for in most elementary manuals on optics, the sections appertaining to lenses and mirrors are treated inadequately. It ought to be recognised, however, that a thorough knowledge of lenses and mirrors is the all-important point of optics. To supply the deficiency of text-books in this respect, Prof. R. C. Bodkin has prepared a little pamphlet—"On Lenses and Mirrors, and the Automatic Image-Finder" (John J. Griffin and Sons)—in which he simplifies the study of lenses and mirrors, and deduces the construction of microscopes, telescopes, &c., from first principles. The image-finder referred to in the title is an ingenious piece of apparatus for illustrating the directions of the rays forming the image of an object.

WE do not often receive a catalogue of educational books, scientific and technical treatises, and works of general knowledge prepared for use in Chinese schools. Therefore we have looked with unusual interest through such a catalogue received from "the well known Chinese Scientific Book Depôt, 407 Hankow Road, Shanghai." According to the title-page of the catalogue, the works described have been translated or written by Dr. John Fryer; and as there are nearly two hundred of them, covering the whole fields of natural and physical sciences, we confess to a reverential feeling for Dr. Fryer's marvellous industry and encyclopædic knowledge. The translations are mostly based upon standard English or American educational books, and are arranged into five series. There is the "outline" series, for general reading and elementary instruction; the "handbook" series, for more advanced students; the "temperance physiology" series, the "magazine" series, adapted for school reading books; and the "Imperial Government" series, consisting of treatises, which together form a valuable encyclopædia. As the avowed object in publishing the works is the higher education and intellectual enlightenment of the Chinese nation, we echo the hope that the use of the translations will continue to extend wherever instruction in scientific subjects is given in the Chinese language.

THE additions to the Zoological Society's Gardens during the past week include two White-shafted Francolins (*Francolinus leucoscepus*) from North-east Africa, presented by Lord Lilford; two Nilotic Crocodiles (*Crocodilus niloticus*) from West Africa, presented by Mr. J. A. McDiarmid; four Hispid Lizards (*Agama hispida*) from South Africa, presented by Mr. J. E. Matcham; an Australian Fruit Bat (*Pteropus poliocephalus* from Australia; a White-fronted Amazon (*Chrysotis leucocephala*) from Cuba, purchased.

OUR ASTRONOMICAL COLUMN.

A NEW VARIABLE STAR OF THE ALGOL TYPE.—Dr. E. Hartwig announced in the middle of September that the star B.D. + 15°·3311 (R.A. 17h. 53m. 36s., Decl. + 15° 8′ 47″·2, 1900) was a variable of the Algol type. He afterwards determined the period to be 3d. 23h. 49m. 32s.·7. (*Astro. Nach.* 3260). It appears, however, that Dr. S. C. Chandler discovered the character of the star's variability at the end of July, and communicated his discovery to several other observers, who confirmed it. The star was assigned the notation 6442 Z. Hercules about the middle of August, the period having previously been determined as 3d. 23h. 50m. Prof. Dunér has found that the minima follow each other at unequal intervals of forty-seven and forty nine hours. There appears to be a secondary minimum which occurs a few hours previous to the time midway between two successive primary minima.

THE POLAR CAPS OF MARS.—Several sketches of Mars, made at the Juvisy Observatory, by M. Antoniadi, accompany a paper by M. Flammarion in the current *Comptes-rendus*. The figures show clearly the slow diminution of the snow-caps of Mars during the summer of the planet's southern hemisphere. The summer solstice occurred on August 31, and the planet was kept under observation from June 1 to November 1. The following are the results of the measures of the diameters of the cap at the south pole of Mars, on different dates:—

Dates.	Areocentric arc.	Diameter in kilometres.
June 1	65°	3900
,, 15	50	3000
July 1	42	2520
,, 15	35	2100
August 1	30	1800
,, 23	15	900
September 27	11	660
November 1	5	300

ENCKE'S COMET.—Prof. M. Wolf has found Encke's comet upon a photograph taken on October 31, that is, a day before Dr. Cerulli's observation, noted last week (*Astr. Nach.* 3262). The comet has been observed by M. Perrotin, and is said to be at the extreme limit of visibility of the twenty-eight-inch refractor of the Nice Observatory.

STATISTICAL ACCOUNT OF FRENCH FORESTS.[1]

M. DAUBRÉE, the Director of the French Forest Department, has recently published a statistical account, up to the end of 1892, of the French forests which are managed by that department; and as these forests, especially in the northern and central parts of France, greatly resemble those which might be grown in the United Kingdom, and of which some badly-managed examples are still to be found, a short notice of this work will be interesting to those who wish to know what are the possibilities of economic forestry at home.

The areas of the forests in question are as follows:—

	Acres.
Belonging to the State	2,691,165
,, communes and public establishments (hospitals, colleges, &c.) ...	4,738,637
Total	7,429,802

Or 11,609 square miles, one-eighteenth of the total area of France, which is about 207,100 square miles.

No account is here taken of the private forests in France, which contain about 20,813 square miles, so that the area of all the forests in France is 32,422 square miles, or 15½ per cent. of the area of the country.

Of the 7½ million acres of forest managed by the State, 18 per cent. of the State forests and 3·6 per cent. of the communal forests are classed as unproductive or not stocked with trees.

A larger proportion of the State forests is unproductive because the State is constantly acquiring waste lands in order to prevent denudation of mountains by torrents, or the encroachment of sandy dunes; whilst land belonging to the communes, &c., which is not fit for reafforesting, is not generally handed over to be managed by the State Forest Department.

Twenty excellent maps are attached to the report, and are differently shaded so as to show the distribution of the forest area among the different *départements*, according to ownership; mode of management (coppice, coppice-with-standards, high-forest); annual degrees of productiveness—in material (cubic metres per hectare); in money (francs per hectare)—and also in oak and coniferous timber.

From these maps and the statement which precedes them, it may be readily seen that the State forests are most extensive north of Lyons, and especially in Lorraine, Bourgogne, Isle de France, Normandy, le Bourbonnais, and that in these provinces there are scarcely any unproductive areas, which chiefly occur in the south of France. The communal forests are also chiefly in the east of France, or bordering on the Pyrenees and in Corsica; this distribution depends on political and not on natural causes, for the climate of the west of France is very favourable to forest growth, and this region contains some magnificent State forests and large areas of forests in private hands. As regards the mode of treatment, the State forests are distributed as follows:—

	Percentage of total area.
Simple coppice	2·5
Coppice-with-standards	29·2
,, under conversion to high forest... ...	16·8
High-forests	51·5

The simple coppice belonging to the State is chiefly situated in the south, where the State shares in the produce with certain communes, or the inhabitants have rights to fuel, which prevent any improvement in their treatment, and they are generally composed of *Quercus Ilex*, which yields tanning bark, and firewood rather than timber.

Coppice-with-standards is applied to large forest areas bordering on Belgium, and to another series of State forests stretching from the Jura towards Paris. These forests are generally situated near large towns or the northern coal mines, and find a ready sale for their somewhat branchy timber and underwood, as building material, pit-props, firewood, &c., provided their rotations are long enough to exclude a large supply of charcoal wood, for which the demands are being gradually restricted.

A large area of coppice with-standards, which is remote from large towns and the coal mines, is being converted into high forest, to increase the supply of timber as compared with firewood.

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[1] Statistique des forêts soumises au régime forestier, Année 1892. Extrait du Bulletin du Ministère de l'Agriculture. Paris: *Imprimerie Nationale*, 1894.